

REMARKS

Claims 7-13, 15-30, and 32-35 are present in this application. Claims 7, 10, 13, 15, 16, 17, and 29 are independent claims. Claims 32-35 are new.

Claim Rejection under 35 USC 101

Claim 13 has been rejected under 35 U.S.C. 101 as being directed to non-statutory subject matter. In particular, the rejection states that the claims are directed to a program product, which is functional descriptive material per se.

Applicants have amended claim 13. Applicants request that the rejection be reconsidered and withdrawn based on claim 13, as amended.

Claim Rejection under 35 USC 102(a) – Shuji

Claims 15-17, 21, 24-26, and 29-31 have been rejected under 35 U.S.C. 102(a) as being anticipated by Shuji. Applicants respectfully traverse this rejection.

Claim 15

With respect to the claimed calculation of “parallax information based on the brightness of the image” of claim 15, the Office Action refers to a statement that a ratio of reflected light from two light sources is calculated based on the ratio of brightness of each pixel (para. 0021).

Shuji discloses calculation of a ratio of the brightness to determine the distance to a photographic subject at each part or each pixel. In contrast, the present invention determines brightness of the image and provides parallax information for each block based on the block’s brightness (Second Embodiment). In particular, the present invention analyzes the difference in

brightness level between blocks, while Shuji determines differences in brightness level for a block based on light from two light sources.

In order to clarify this feature, Applicants have amended claim 15 to explicitly recite that “brightness of the image” is differences in brightness between different parts of the image. As mentioned above, Shuji teaches determining distance for a pixel based on a ratio of brightness levels from two light sources.

Applicants request reconsideration and withdrawal of the rejection of claim 15, as amended.

Claim 16

Applicants have amending claim 16 to incorporate claim 31.

With respect to claim 16, the Office Action refers to the ratio of reflectivity of each part as mentioned in paragraph 0016 of Shuji. With respect to the feature from claim 31 that parallax information is “determined based on a distance between human eyes,” the Office Action refers to paragraphs 0038 and 0003 of Shuji.

Paragraph 0038 indicates that the amount the image of the object for the right eye and for the left eye makes shift a pixel from the image of Hara to right and left according to the distance to a photographic subject. In other words, the amount of shift of a pixel is determined based on the distance between the camera and a photographic subject for the image associated with that pixel (Shuji at para. 0013, 0014).

Paragraph 0003 of Shuji applies to a stereoscopic camera having two photography systems spaced by both eyes of a human, while the invention of Shuji is directed to a single

camera and distance acquisition means. There is no teaching of the single camera approach of Shuji for determining parallax based on the distance between human eyes.

At least for these reasons, Applicants request that the rejection of claim 16 be reconsidered and withdrawn.

Claim 17

With respect to the first data processing means of claim 17, the Office Action refers to paragraph 0010, which states “give different parallax information to each part of a photographic subject,” and to paragraph 0038, which states “amount which the image the object for right eyes ... and for left eyes makes shift a pixel from the image of Hara...”

Applicants submit that “generate the 3-dimensional scenography of a photographic subject” of paragraph 0010 is generation of the right and left eye images of paragraph 0038. Applicants submit that Shuji only teaches conversion of a 2-dimensional image into an image for the right eye and an image for the left eye based on the distance of each part of the captured image to the subject. (Shuji at para. 0037)

Thus, Shuji does not teach at least the claimed “generating three dimensional data.”

At least for these reasons, Applicants request that the rejection of claim 17 be reconsidered and withdrawn.

These arguments apply as well to respective dependent claims.

Claim Rejection under 35 USC 103(a); Shuji, Aoki

Claims 7-13, 22, 27, and 28 have been rejected under 35 U.S.C. 103(a) as being unpatentable over Shuji in view of U.S. Publication 2002/0054032 (Aoki). Applicants respectfully traverse this rejection.

Summary of the Invention

The present invention is directed to a display of 3D images using a technique that is simple enough for a mobile camera phone having only an LCD capable of displaying a 3D image. For example, the mobile equipment generates a stereoscopic image from a single two-dimensional image using a geometry model and parallax information.

The present invention involves a method (shown in Fig. 4) in which a 2D image is picked-up by the camera of the mobile equipment. A part of the image is selected, extracted, and mapped to a three-dimensional geometry model. Three dimensional data of the extracted part is provided with parallax information, i.e., an angle α formed by a line extending between the subject's face and one eye and the subject's face and the other eye assumed at the position of the camera. A processor creates a 3D image including an image for the right eye and an image for the left eye based on the 3D data and parallax information.

In a preferred embodiment, the parallax information is determined based on a predetermined distance, or user input distance, between the camera and subject.

Shuji

Shuji discloses an image equipment that generates a stereoscopic view of an image. In particular, Shuji teaches a small 3-dimensional equipment including an ocellus optical system for taking a photograph in a narrow space, and a means for generating a 3-dimensional scenography image (para. 0008, 0009). Shuji's image equipment works without the need for two photography systems, a separate attachment, or moving a camera to two or more locations for different views (para. 0005, 0007).

Shuji discloses that a stereoscopic camera is the easiest device to produce a binocular-vision image. The stereoscopic camera includes a right-hand side camera and a left-hand side camera that photograph at "spacing equivalent to the parallax of the human being's both eyes,"

(para. 0003). The right-hand side camera and left-hand side camera are considered as being two photography systems equivalent to both eyes which can photograph a binocular-vision image. Shuji expresses that the stereoscopic camera has a problem that it is a large device requiring two photographic systems.

Shuji's solution is a distance acquisition means for acquiring distance information for each part of a photographic subject, and an image acquisition means to acquire image information. In turn, Shuji's system generates 3-dimensional scenography based on different parallax for each part of a photographic subject. Drawing 2 shows an approach to giving parallax to image information (para. 0011). Image scenes are generated for the location where the view is shifted from the camera station. In an example, for a view shifted to the right, a close body 1a shifts to the left more compared to a body 1b far from the camera. Thus, when generating the image for the right eye, pixels which display closer body 1a are shifted to the left by a greater amount than pixels which display farther body 1b. When generating the image for the left eye, pixels are shifted to the right. Thus, the direction which the pixels which constitute the image photographed with the camera are shifted is decided, and a 3-dimensional scenography is obtained by shifting pixels which display a closer body by a greater amount than pixels which display a farther body. In other words, the shift amount of a pixel is determined based on the distance between the camera and the subject for the image associated with that pixel. (para. 0013, 0014).

Shuji's distance acquisition means determines distance based on two or more luminescence locations. An operation means computes the distance from the luminescence location of each part based on the ratio of reflectivity of each part to which each reflected light

image is independently photographed with image pick-up means (para. 0016). Drawing 3 shows the principle of computing distance between the camera and a part of the subject. (formula (5) in paras. 0019-0022). The distance can be computed for each pixel of a photographic subject (para. 0022).

Office Action

With respect to the claimed “determining parallax information of said subject based on a distance between human eyes,” the Office Action refers to para. 0038 of Shuji. Paragraph 0038 of a machine translation of Shuji states that,

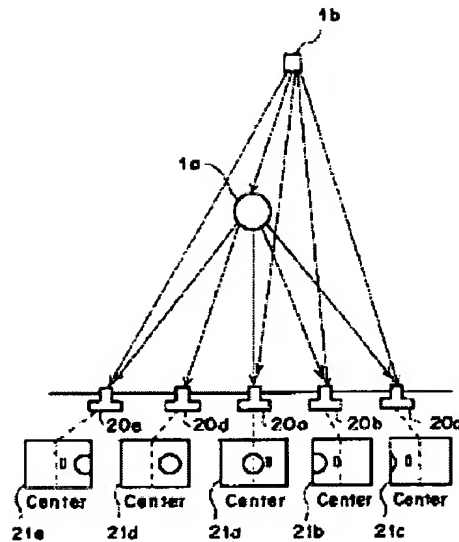
“The amount to which the amount which the image the object for right eyes which constitutes the binocular vision image displayed on a head-mounted display 120, and for left eyes makes a shift a pixel from the image of Hara to right and left according to the distance to a photographic subject by the above-mentioned principle is decided, and shifts each pixel with the magnitude of parallax on either side further is multiplied by the multiplier. A cubic effect can be emphasized or reduced by adjusting this multiplier.”

The Office Action also relies on paragraph 0003, which describes a stereoscopic camera having two photographic systems spaced equivalent to the parallax of a human’s eyes (Office Action, statement bridging pages 10 and 11).

Differences over Shuji and Aoki

As can be seen in Drawing 2 of Shuji, the distance between an object and the camera, which is determined from a difference in brightness for two light sources, is used to determine the amount of shift of pixels related to the respective object.

【図2】



Drawing 2 shows that the relative shift between two objects as the camera view is moved, is based on the distance to each respective object. Thus, Shuji discloses that when generating the image for the right eye, pixels near body 1a are shifted to the left, while pixels near body 1b are shifted to the left by a lesser amount (para. 0013). In other words, the 3-dimensional scenography image is generated based on distance distribution information (para. 0030).

Thus, it can be seen that Shuji does not disclose that parallax of a photographic subject is determined based on a distance between human eyes.

Furthermore, paragraph 0003 of Shuji applies to a stereoscopic camera having two photography systems spaced by both eyes of a human, while the invention of Shuji is directed to

a single camera and distance acquisition means. There is no teaching of the single camera approach of Shuji for determining parallax based on the distance between human eyes.

Aoki is relied on for teaching cutting out a face image from an image (see Fig. 24). Aoki does not disclose determining parallax information for the face image based on the distance between human eyes, and thus does not make up for the deficiency in Shuji.

For at least these reasons, Applicants submit that Shuji and Aoki fail to teach each and every claimed element of claims 7-13, 22, 27, and 28. Applicants request that the rejection be reconsidered and withdrawn.

Claim Rejection under 35 USC 103(a) – Shuji, Taniguchi

Claims 18-20 have been rejected under 35 U.S.C. 103(a) as being unpatentable over Shuji in view of U.S. Patent 6,940,646 (Taniguchi). Applicants traverse this rejection.

Taniguchi teaches a stereoscopic image display.

Claims 18-20 depend from claim 17. Applicants submit that at least for the reasons above for claim 17, the rejection fails to establish *prima facie* obviousness for claims 18-20, as well.

Claim Rejection under 35 USC 103(a) – Shuji, Tao

Claim 23 have been rejected under 35 U.S.C. 103(a) as being unpatentable over Shuji in view of Aoki, and further in view of U.S. Patent 5,818,463 (Tao). Applicants traverse this rejection.

Claim 23 depends from claim 17 and further recites that the first data processing means generates the three dimensional data from the human face image data based on the face

geometry model. Claim 17 in turn recites, “a first data process means for generating three dimensional data derived from the two dimensional data.”

In rejecting claim 23, the Office Action relies on teachings in Tao of a quadrangular face model. In rejecting claim 17, the Office Action relies on paragraph 0010 of Shuji for teaching the claimed first data process means. Applicants submit that there is no nexus between teachings in Shuji and teachings in Tao.

Shuji teaches use of distance information of each pixel in converting an image into a three dimensional scenography image (para. 0010, para. 0030). There is no teaching of an intermediate step of generating three dimensional data, followed by the conversion of the three dimensional data into a three dimensional image (image data for the right eye and image data for the left eye).

Applicants submit that Tao does not teach generating three dimensional data based on a face geometry model (per the language in claim 23). Tao only discloses an approach to generating a face geometry model. Furthermore, Tao does not teach generation of three dimensional data from two dimensional data based on the face geometry model, as required in the instant claims (claim 23 incorporated with claim 17).

For at least these reasons, Applicants request that the rejection of claim 23 be reconsidered and withdrawn.

New Claims

The new claims, added as dependent claims, define “three dimensional data” in terms of generation based on the geometry model, and conversion of the three dimensional data into the “three dimensional image.” Applicants submit that the cited prior art does not disclose or

render obvious generation of three dimensional data based on a geometry model as an approach to producing a three dimensional image in a mobile equipment.

CONCLUSION

In view of the above amendment, applicant believes the pending application is in condition for allowance.

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact Robert Downs Reg. No. 48,222 at the telephone number of the undersigned below, to conduct an interview in an effort to expedite prosecution in connection with the present application.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37.C.F.R. §§1.16 or 1.14; particularly, extension of time fees.

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Respectfully submitted,

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